

Exercise-I

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|-------|-------|-------|-------|-------|-------|-------|
| 1. C | 2. A | 3. B | 4. A | 5. B | 6. B | 7. C |
| 8. C | 9. C | 10. B | 11. D | 12. B | 13. B | 14. D |
| 15. C | 16. C | 17. B | 18. C | 19. C | 20. B | 21. C |
| 22. D | 23. A | 24. B | 25. B | 26. C | 27. A | 28. C |
| 29. B | 30. A | 31. C | 32. D | 33. A | 34. C | 35. B |
| 36. B | 37. A | 38. E | 39. C | 40. C | 41. C | 42. B |
| 43. C | 44. D | 45. A | 46. A | 47. C | 48. D | |

Exercise-II

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|----------|----------|---------|---------|--------|--------|----------|
| 1. A,B,D | 2. A,C | 3. C | 4. A,D | 5. B,C | 6. C,E | 7. A,C,D |
| 8. A,B,C | 9. A,B,C | 10. C,D | 11. A,C | | | |

Exercise-III

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|--|--|---|---|-----------------------------|
| 1. 4.0016 u | 2. 492 MeV | 3. 5.58 MeV | 4. 17.34 MeV | 5. 1.86 MeV |
| 6. (a) ${}^{40}_{19}\text{K} \rightarrow {}^{40}_{20}\text{Ca} + e^- + \bar{\nu}$, ${}^{40}_{19}\text{K} \rightarrow {}^{40}_{18}\text{Ar} + e^+ + \nu$, ${}^{40}_{19}\text{K} + e^- \rightarrow {}^{40}_{18}\text{Ar} + \nu$
(b) 1.3034 MeV, 0.4676 MeV, 1.490 MeV | | | | |
| 7. 5.304 MeV | 8. 11.88 MeV | 9. (a) 4.816 MeV (b) 3.254 MeV | 10. 1.182 MeV | |
| 11. 0.2806 MeV | 12. 3.7 mg | 13. – 93.1 KeV, No | 14. 23.6 MeV | |
| 15. $8/3 \times 10^{18}$ sec | 16. 2.48×10^{-12} m | 17. 28 MeV | 18. 9×10^6 | 19. Fusion, 24 20. 152 min. |
| 21. 4.5×10^{10} y old | 22. ($T_{1/2} = 10.8$ sec) | 23. (i) ${}^{40}_{19}\text{K} \rightarrow {}^{40}_{18}\text{Ar} + {}^0_{+1}e + \nu$, (ii) 4.2×10^9 years | 24. $t = \left(\frac{\ln 5}{\ln 2} \right) \tau$ | |
| 25. (a) 14 μCi , (b) $1.4 \times 10^{-6} \text{ sec}^{-1}$ | 26. (a) 6.49×10^9 y, (b) 4.5×10^9 y, (c) 4 | | | |
| 27. (a) β^+ , (b) 24 min | 28. 1.92×10^9 y | 29. (a) $N = \frac{1}{\lambda} [\alpha(1 - e^{-\lambda t}) + \lambda N_0 e^{-\lambda t}]$ (b) $\frac{3N_0}{2}$, $2N_0$ | | |

Exercise-IV

1. 4.87 MeV 2. 3.3×10^{-6} g 3. 7.01366 amu 5. $v = u\lambda t$ 6. $\Delta T = \frac{0.2E_0 \left[\alpha t - \frac{\alpha}{\lambda} (1 - e^{-\lambda t}) \right]}{mS}$
7. 6.04×10^9 yrs 8. 1.7×10^{10} years 9. 5196 yrs 10. $\cong 33.298 \mu W$ 11. 6 litre
12. (i) $t_{1/2} = 10$ sec., $t_{\text{means}} = 14.43$ s
(ii) 40 sec.

Exercise-V

1. D 2. C 3. D 4. 3.847×10^4 kg
5. (a) 6.25 MeV (b) 227.62 amu
6. (a) $\frac{dN_x}{dt} = -\lambda_x N_x$, $\frac{dN_y}{dt} = \lambda_x N_x - \lambda_y N_y$, $\frac{dN_z}{dt} = \lambda_y N_y$, (b) 16.48 s, (c) $N_x = 1.92 \times 10^{19}$, $N_z = 2.32 \times 10^{19}$
7. A 8. C 9. A 10. A 11. $1.75 n = N_0(1 - e^{-4\lambda})$, 6.95 sec, $\frac{2}{\ln\left(\frac{4}{3}\right)}$
12. B 13. 0.259 14. A 15. B 16. C
17. (A) P, Q ; (B) P, R ; (C) S, P ; (D) P, Q, R
18. A 19. B
20. (A) R, P ; (B) Q, S ; (C) P ; (D) Q
21. B, D 22. A 23. D 24. A 25. B 26. 8 27. 1
28. C 29. D